



Watt's Up?

The ComEd Residential Real-Time Pricing Program Monthly Newsletter



Electricity Basics (the ABCs of what you should know but didn't know to ask)

We enter a dark room, flip a switch and, in an instant, the room lights up. It's routine. We hardly stop to think about what we're doing. And we rarely ask how something so commonplace so easily occurs.

Yet the journey of electricity to the light bulb in your room is long and complex. There are twists and turns and stops along the way. Electricity's very creation is testimony to our scientific capacity to create technology that utilizes our available basic natural resources.

Let's consider some of the essential information about how electricity is produced and travels to your home.

To start, we might go back to school and consider the atom. You recall that it is composed of three basic components. In the nucleus of the atom are neutrons (no charge) and protons (positive charge). Circling the nucleus are electrons (negative charge). The number of electrons is usually proportional to the number of protons.

When an outside force such as friction or magnetism causes electrons to move to other atoms, the result is an electrical current. If electrons are then forced to move in the same direction along a conductor that attracts electrons (such as a copper wire), a magnetic field builds around the conductor. And if the magnetic field is then forced to move along the conductor, that's when things become really interesting, because we can then control that movement, directing it along power lines, ultimately transmitting it to our homes for our end use.

Electricity as a secondary energy source

For there to be electricity created in the quantity we need, electrons must be forced into motion by a primary energy source such as coal, oil, natural gas, or uranium. In other words, mechanical energy—and lots of it—is necessary to create electrical energy. For our purposes, that mechanical energy comes from a generator.

To supply all of our needs, we have to have really big generators. These big generators have big magnets attached to the ends of rotating shafts inside a large conducting ring wrapped in copper wiring. When the shafts move, the magnets pass along the wires, creating a magnetic field that causes the electrons in the wire to jump from atom to atom, thus producing an electrical current.

These generator shafts are powered by turbines, water wheels, or engines that produce the mechanical energy needed to rotate them. For instance, the most common U.S. source of energy is from steam turbines. Most often, fossil fuel is burned to create the steam that causes the shafts to spin.

The long electric journey

Next, the electrons sequentially flow from the generator along wire cables to a transformer. Why? Because electrons naturally move to atoms where there is less charge along the cable. The difference in charges between two points is actually the push or electromotive force, commonly referred to and quantified as voltage (or volts). The purpose of the transformer is to increase the charge to add additional pressure/volts to force the electron movement to flow a longer distance. The number of electrons flowing is the current, measured like water current in a river, but using units called amperes (or amps). The path along which they flow is known as the circuit.

The circuit continues to a transmission station where it can then be directed by the generating company to its client businesses and utilities – such as ComEd – connected to that particular grid who have purchased the electricity in the wholesale auction market.

Before arriving in your home or business, the volts must be slowed down again. The electrons move along transmission lines, arriving at substations where the volts are transformed to reduce the amps before resuming their relatively shorter journey to your home.

Some might think that the flow of electrons move instantaneously. They actually move quite slowly – at 84 millimeters per hour. However, because the atoms along the conductive wiring are so tightly connected, the vibrating effect of the electrons from one to the next is incredibly fast – like tightly stacked dominoes. The atoms themselves don't really move. In fact, those atoms in your electric socket are probably the same atoms that were there when your house was first built.

Next time you flip the switch. . .

You might now have a new appreciation for what's involved in bringing electricity to your home. Because fossil fuel is needed to produce that electricity for your home, the cost of electricity is very much tied to the cost of those primary energy sources. ComEd does not own any generating plants; it must purchase the electricity from generators in the wholesale market. The real-time hourly price that we pay is more closely associated with the real-time costs to generate and transport that electricity than the basic fixed-rate service.

We hope these electricity basics shine a light for you. We welcome your comments. And thank you as always for participating with us in the ComEd RRTP program.

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Sources:

www.radioelectronicschool.net
www.epsa.org
www.inventors.about.com/library/inventors/bleelectric1.htm
www.pbs.org/tesla/ins/ins_elec.html
www.telesensoryview.com/steverosecom/Articles/UnderstandingBasicElectri.html
www.santee.org/kids/absofelectricity.html
www.pnl.gov/energy/eed/etd/pdfs/pnnl-14396.pdf
www.masstech.org/cleanenergy/energy/glossaryenergymeas.htm
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